

SEQUENCE LISTING

<110> KANNO , SOHEI  
MATSUI, KAZUHIKO  
NAKAMATSU, TSUYOSHI  
KIMURA, EIICHIRO

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<140> US09/868338

<141> 2001-06-18

<150> JP 10/360621

<151> 1998-12-18

<150> PCT/JP 99/07079

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<170> PatentIn version 3.1

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1				5				10					15			

gga	tcg	cta	acc	ggt	aac	ctc	agt	gaa	cta	cgt	gca	caa	act	act	ttt	96
Gly	Ser	Leu	Thr	Gly	Asn	Leu	Ser	Glu	Leu	Arg	Ala	Gln	Thr	Thr	Phe	
			20					25					30			

agt	aca	tta	tgg	gat	acc	cat	aaa	gaa	acc	tat	aga	gtc	tcc	ata	gct	144
Ser	Thr	Leu	Trp	Asp	Thr	His	Lys	Glu	Thr	Tyr	Arg	Val	Ser	Ile	Ala	
		35				40						45				

tcc	gca	gca	gga	caa	gac	ttc	tac	ggg	ctt	gct	gag	act	cta	cgc	act	192
Ser	Ala	Ala	Gly	Gln	Asp	Phe	Tyr	Gly	Leu	Ala	Glu	Thr	Leu	Arg	Thr	
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gct	ccc	ctt	gat	atc	ggt	gca	cca	gtc	gta	tta	tca	aac	aca	act	ttt	288
Ala	Pro	Leu	Asp	Ile	Gly	Ala	Pro	Val	Val	Leu	Ser	Asn	Thr	Thr	Phe	
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gcc	gtt	gat	gaa	gga	cta	ctt	gcg	cca	aaa	gat	cta	ccg	caa	agt	gac	336
Ala	Val	Asp	Glu	Gly	Leu	Leu	Ala	Pro	Lys	Asp	Leu	Pro	Gln	Ser	Asp	
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gag	atc	aca	ata	ttg	cat	cct	cag	ttt	ctg	gat	tcg	gcc	aaa	gag	cca	384
Glu	Ile	Thr	Ile	Leu	His	Pro	Gln	Phe	Leu	Asp	Ser	Ala	Lys	Glu	Pro	
		115					120					125				
gaa	tta	ctt	ggc	ttg	ctg	gag	ttc	gaa	gca	tcc	aac	tca	caa	gtg	cca	432
Glu	Leu	Leu	Gly	Leu	Leu	Glu	Phe	Glu	Ala	Ser	Asn	Ser	Gln	Val	Pro	
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Met	Pro	Lys	Ile	Gln	Ser	Ile	Pro	Tyr	Asp	Ser	Glu	Asp	Ser	Thr	Asn	
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ccc	atg	tct	gaa	gtt	ttt	acc	tac	aac	att	aac	ctg	gat	agt	gca	gta	528
Pro	Met	Ser	Glu	Val	Phe	Thr	Tyr	Asn	Ile	Asn	Leu	Asp	Ser	Ala	Val	
				165					170					175		
aga	aac	cca	atc	gta	gtt	atc	ctt	ccc	gca	ggc	tta	gag	ctt	tta	agt	576
Arg	Asn	Pro	Ile	Val	Val	Ile	Leu	Pro	Ala	Gly	Leu	Glu	Leu	Leu	Ser	
			180					185					190			
gat	caa	aat	ttg	tcg	gct	cga	ctc	aca	cag	aat	agt	ctg	ctg	ata	aaa	624
Asp	Gln	Asn	Leu	Ser	Ala	Arg	Leu	Thr	Gln	Asn	Ser	Leu	Leu	Ile	Lys	
		195					200					205				
gac	cag	act	ggc	gtg	aac	gct	ctt	cta	tcc	tca	gag	gat	tca	cgc	aat	672
Asp	Gln	Thr	Gly	Val	Asn	Ala	Leu	Leu	Ser	Ser	Glu	Asp	Ser	Arg	Asn	
		210				215					220					
tat	gtg	gga	gct	gca	tcc	ccg	atg	att	gac	acg	tgg	gaa	gaa	agc	gtt	720
Tyr	Val	Gly	Ala	Ala	Ser	Pro	Met	Ile	Asp	Thr	Trp	Glu	Glu	Ser	Val	
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gtt	cgg	ttg	aag	gaa	gcg	aac	caa	ata	atc	gcc	ttc	aac	gct	ttc	att	768
Val	Arg	Leu	Lys	Glu	Ala	Asn	Gln	Ile	Ile	Ala	Phe	Asn	Ala	Phe	Ile	
				245					250					255		
gca	ttg	ttc	ctc	acg	acg	act	ctt	gtt	cta	gca	tac	tgc	act	ggc	att	816
Ala	Leu	Phe	Leu	Thr	Thr	Thr	Leu	Val	Leu	Ala	Tyr	Cys	Thr	Gly	Ile	
			260					265					270			
tca	ttt	aag	aaa	tca	aag	aag	act	atg	ggc	agc	gca	tct	act	agg	aaa	864
Ser	Phe	Lys	Lys	Ser	Lys	Lys	Thr	Met	Gly	Ser	Ala	Ser	Thr	Arg	Lys	
		275					280					285				
tca	tcc	att	aag	agc	tcg	att	aca	gct	gct	aat	tgt	aga	agt	aat	ttt	912
Ser	Ser	Ile	Lys	Ser	Ser	Ile	Thr	Ala	Ala	Asn	Cys	Arg	Ser	Asn	Phe	
	290					295					300					
cgc	ttc	aat	tcc	gtg	cgt	ctg	gct	cgc	gaa	ccg	cta	ttt	cga	gcg	atc	960
Arg	Phe	Asn	Ser	Val	Arg											

caa ttc tat acc tcc atc act gcc gtt ggt ttt agg aat ctt aat aat	1056
Gln Phe Tyr Thr Ser Ile Thr Ala Val Gly Phe Arg Asn Leu Asn Asn	
340 345 350	
cgg ttg gac ttc act ttc att ttt cag ttc gat gaa gct tcc ttt	1101
Arg Leu Asp Phe Thr Phe Ile Phe Gln Phe Asp Glu Ala Ser Phe	
355 360 365	
tgaaaagagc acaca atg ata gaa atc aat gac ctc aag aaa tct ttt ggc	1152
Met Ile Glu Ile Asn Asp Leu Lys Lys Ser Phe Gly	
370 375	
gtt cgg atc tta tgg caa ggt ctc agt cat aag ttt tta cca gga aca	1200
Val Arg Ile Leu Trp Gln Gly Leu Ser His Lys Phe Leu Pro Gly Thr	
380 385 390 395	
atg aca gca ctg act gga gcg tcc ggt tca gga aaa tcg act ttg ctc	1248
Met Thr Ala Leu Thr Gly Ala Ser Gly Ser Gly Lys Ser Thr Leu Leu	
400 405 410	
aac tgt ctt ggc aca ctt gac aaa cca agt tcc gga cag atc ctt gtc	1296
Asn Cys Leu Gly Thr Leu Asp Lys Pro Ser Ser Gly Gln Ile Leu Val	
415 420 425	
gag gat gta gac ctt ctg aaa ctc tct acg cgt aag caa cgg tta tac	1344
Glu Asp Val Asp Leu Leu Lys Leu Ser Thr Arg Lys Gln Arg Leu Tyr	
430 435 440	
agg aaa aat acg gtg ggc tat tta ttt caa gat tat gcc ttg att ccc	1392
Arg Lys Asn Thr Val Gly Tyr Leu Phe Gln Asp Tyr Ala Leu Ile Pro	
445 450 455	
gac agg aca gtt aaa ttc aac ctt cag ctt gcg gtg gaa aaa cac aaa	1440
Asp Arg Thr Val Lys Phe Asn Leu Gln Leu Ala Val Glu Lys His Lys	
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tgg cct gaa att cct caa gta ctt cat gct gtt ggt ctt gag tcg ttc	1488
Trp Pro Glu Ile Pro Gln Val Leu His Ala Val Gly Leu Glu Ser Phe	
480 485 490	
gag gaa aag cca gtt ttt gaa ctc tct ggt ggc gaa caa caa cga act	1536
Glu Glu Lys Pro Val Phe Glu Leu Ser Gly Gly Glu Gln Gln Arg Thr	
495 500 505	
gcg ttg gcc cgg gta ctg ctc aaa aat ccc cga ata att ctg gct gat	1584
Ala Leu Ala Arg Val Leu Leu Lys Asn Pro Arg Ile Ile Leu Ala Asp	
510 515 520	
gaa cca acc gga gct cta gat tta aca aac agt gag cta gtc ata gaa	1632
Glu Pro Thr Gly Ala Leu Asp Leu Thr Asn Ser Glu Leu Val Ile Glu	
525 530 535	
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Ala Leu Arg Ala Leu Ala Asp Lys Gly Ala Thr Val Val Val Ala Thr	
540 545 550 555	
cac tcg ccc ctc ttc cga gaa tca gcg gat acc att atc aaa cta	1725

His Ser Pro Leu Phe Arg Glu Ser Ala Asp Thr Ile Ile Lys Leu	
560	570
taggtgcccc aacttttcg agatctcagt gca atg atg gaa ttc tta aac act	1779
Met Met Glu Phe Leu Asn Thr	575
cac cgt ttg att gtt ctc ggg agt ttg tct ttt cta ggg cta ggt ttc	1827
His Arg Leu Ile Val Leu Gly Ser Leu Ser Phe Leu Gly Leu Gly Phe	580 585 590
gcg gaa gtc ctg ctg cgt ggc cag tgg tca aca ccg cag ttt ttt gtt	1875
Ala Glu Val Leu Leu Arg Gly Gln Trp Ser Thr Pro Gln Phe Phe Val	595 600 605
ttc act ttc ttg caa act ctg ctt ctc gta ttg tgt ttt att cct aaa	1923
Phe Thr Phe Leu Gln Thr Leu Leu Leu Val Leu Cys Phe Ile Pro Lys	610 615 620 625
ctc tcg gtt cct ttt gtg gtg ctt cta agc att gcc caa ctc gcg ctt	1971
Leu Ser Val Pro Phe Val Val Leu Leu Ser Ile Ala Gln Leu Ala Leu	630 635 640
gca tac ctg tgt att cat ggt gaa cct caa agc acc agc cct ttc act	2019
Ala Tyr Leu Cys Ile His Gly Glu Pro Gln Ser Thr Ser Pro Phe Thr	645 650 655
tta att gtt gcc caa atg gcg ttt tcg gga ttg ctc atg ttc aga ggg	2067
Leu Ile Val Ala Gln Met Ala Phe Ser Gly Leu Leu Met Phe Arg Gly	660 665 670
caa cgg gtg ctc gct ttt atc tct gca ggt ggg ctc att tgg att ggg	2115
Gln Arg Val Leu Ala Phe Ile Ser Ala Gly Gly Leu Ile Trp Ile Gly	675 680 685
acc atc gat cca aca aac ggt gct tgg tct cct cat gtg atg tcc gcg	2163
Thr Ile Asp Pro Thr Asn Gly Ala Trp Ser Pro His Val Met Ser Ala	690 695 700 705
cta gca ctt gcc gta ttc ttt gcg ctg tcg atg gca ctt gga cag gtt	2211
Leu Ala Leu Ala Val Phe Phe Ala Leu Ser Met Ala Leu Gly Gln Val	710 715 720
ctt cga tca aaa gtt gaa caa aga gcc aac ctt gag gag cag gca aaa	2259
Leu Arg Ser Lys Val Glu Gln Arg Ala Asn Leu Glu Glu Gln Ala Lys	725 730 735
att cag aca gaa ctg cgc aga aaa gaa cta agc act cca tct gca tcg	2307
Ile Gln Thr Glu Leu Arg Arg Lys Glu Leu Ser Thr Pro Ser Ala Ser	740 745 750
gtc ggt tgc caa aga act tac gtt tgc agt gat gaa atc gca gga gct	2355
Val Gly Cys Gln Arg Thr Tyr Val Cys Ser Asp Glu Ile Ala Gly Ala	755 760 765
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<213> Brevibacterium lactofermentum .

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Ser Thr Leu Trp Asp Thr His Lys Glu Thr Tyr Arg Val Ser Ile Ala  
35 40 45

Ser Ala Ala Gly Gln Asp Phe Tyr Gly Leu Ala Glu Thr Leu Arg Thr  
50 55 60

Met Asp Arg His Gly Glu Ile Ile Leu Ala Asp Arg Gln Trp Leu Thr  
65 70 75 80

Ala Pro Leu Asp Ile Gly Ala Pro Val Val Leu Ser Asn Thr Thr Phe  
85 90 95

Ala Val Asp Glu Gly Leu Leu Ala Pro Lys Asp Leu Pro Gln Ser Asp  
100 105 110

Glu Ile Thr Ile Leu His Pro Gln Phe Leu Asp Ser Ala Lys Glu Pro  
115 120 125

Glu Leu Leu Gly Leu Leu Glu Phe Glu Ala Ser Asn Ser Gln Val Pro  
130 135 140

Met Pro Lys Ile Gln Ser Ile Pro Tyr Asp Ser Glu Asp Ser Thr Asn  
145 150 155 160

Pro Met Ser Glu Val Phe Thr Tyr Asn Ile Asn Leu Asp Ser Ala Val  
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Arg Asn Pro Ile Val Val Ile Leu Pro Ala Gly Leu Glu Leu Leu Ser



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Tyr	Val	Gly	Ala	Ala	Ser	Pro	Met	Ile	Asp	Thr	Trp	Glu	Glu	Ser	Val				
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Val	Arg	Leu	Lys	Glu	Ala	Asn	Gln	Ile	Ile	Ala	Phe	Asn	Ala	Phe	Ile				
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Ala	Leu	Phe	Leu	Thr	Thr	Thr	Leu	Val	Leu	Ala	Tyr	Cys	Thr	Gly	Ile				
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Ser	Phe	Lys	Lys	Ser	Lys	Lys	Thr	Met	Gly	Ser	Ala	Ser	Thr	Arg	Lys				
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Ser	Ser	Ile	Lys	Ser	Ser	Ile	Thr	Ala	Ala	Asn	Cys	Arg	Ser	Asn	Phe				
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Arg	Phe	Asn	Ser	Val	Arg	Leu	Ala	Arg	Glu	Pro	Leu	Phe	Arg	Ala	Ile				
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Gln	Phe	Tyr	Thr	Ser	Ile	Thr	Ala	Val	Gly	Phe	Arg	Asn	Leu	Asn	Asn				
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<213> Brevibacterium lactofermentum

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Thr	Leu	Asp	Lys	Pro	Ser	Ser	Gly	Gln	Ile	Leu	Val	Glu	Asp	Val	Asp
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Leu	Leu	Lys	Leu	Ser	Thr	Arg	Lys	Gln	Arg	Leu	Tyr	Arg	Lys	Asn	Thr
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Val	Gly	Tyr	Leu	Phe	Gln	Asp	Tyr	Ala	Leu	Ile	Pro	Asp	Arg	Thr	Val
				85					90					95	
Lys	Phe	Asn	Leu	Gln	Leu	Ala	Val	Glu	Lys	His	Lys	Trp	Pro	Glu	Ile
			100					105					110		
Pro	Gln	Val	Leu	His	Ala	Val	Gly	Leu	Glu	Ser	Phe	Glu	Glu	Lys	Pro
		115					120					125			
Val	Phe	Glu	Leu	Ser	Gly	Gly	Glu	Gln	Gln	Arg	Thr	Ala	Leu	Ala	Arg
	130					135					140				
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<213> Brevibacterium lactofermentum

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Ser Thr Pro Gln Phe Phe Val Phe Thr Phe Leu Gln Thr Leu Leu Leu  
35 40 45

Val Leu Cys Phe Ile Pro Lys Leu Ser Val Pro Phe Val Val Leu Leu  
50 55 60

Ser Ile Ala Gln Leu Ala Leu Ala Tyr Leu Cys Ile His Gly Glu Pro  
65 70 75 80

Gln Ser Thr Ser Pro Phe Thr Leu Ile Val Ala Gln Met Ala Phe Ser  
85 90 95

Gly Leu Leu Met Phe Arg Gly Gln Arg Val Leu Ala Phe Ile Ser Ala  
100 105 110

Gly Gly Leu Ile Trp Ile Gly Thr Ile Asp Pro Thr Asn Gly Ala Trp  
115 120 125

Ser Pro His Val Met Ser Ala Leu Ala Leu Ala Val Phe Phe Ala Leu  
130 135 140

Ser Met Ala Leu Gly Gln Val Leu Arg Ser Lys Val Glu Gln Arg Ala  
145 150 155 160

Asn Leu Glu Glu Gln Ala Lys Ile Gln Thr Glu Leu Arg Arg Lys Glu  
165 170 175

Leu Ser Thr Pro Ser Ala Ser Val Gly Cys Gln Arg Thr Tyr Val Cys  
180 185 190

Ser Asp Glu Ile Ala Gly Ala Gln Trp Ser Arg  
195 200